

AUSTIN ENERGY PURCHASE

SPECIFICATION FOR

**RECLOSER, 3PH, ELECTRONIC,
DISTRIBUTION TYPE, OH, 800A**

1. History chart

Prepared By	Issuance/Revision	Approved By	Date Approved
Obaid Rehman	New Recloser Specification	Julius Heslop	12/13/2018
Julius Heslop	Revision 1		3/27/2020

REASON FOR REVISION	AFFECTED PARAGRAPHS
Control and Power cables to be specified at 50' in lieu of 30'. Connection on bottom of SEL control cabinet needs the cover option. SEL part number change: Provide accessory options for the SEL control cabinet, radio mounting plate. AE uses the Sierra GX450 radio. 32 pin control cable instead of 24 pin	5.5, 5.6 6.1.7 6.4.1

This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein. Retain for future reference.

1.0 SCOPE AND CLASSIFICATION

1.1 Scope

This specification applies to 3 phase distribution circuit Recloser with a rated maximum voltage of 15kV, a continuous operating current of 800 Amps or greater, and a minimum 12.5 kA symmetrical interrupting rating. The Recloser is designed for distribution pole mounted installations. The Recloser will be utilized to improve system coordination, reduce momentary outages, improve reliability and simultaneously isolate permanent faults. All of the unit's protection and metering functions shall be electronically controlled.

1.2 Classification

The Recloser will be installed on a 12.47kV wye configured, 3 phase, 4 wire, and solidly grounded neutral circuit distribution system. The Recloser will be installed below an altitude of 1000 meters and subjected to an annual ambient temperature variance of -25°C to +40°C. The average temperature for any 24-hour period will not exceed 30°C.

2.0 APPLICABLE STANDARDS

- 2.1 The equipment supplied in accordance with this specification shall comply with the applicable provisions of the latest IEEE and ANSI/IEEE, and IEC standards relating to Recloser. In case of any conflict between any of the standards mentioned in this specification and the contents of this document, AE's specification shall govern. The applicable standards include, but are not limited to, the following:
- 2.2 ANSI/IEEE C37.60 use the latest revision American National Standards Requirements for Overhead, Pad Mounted, Dry Vault, and Submersible Automatic Circuit Recloser and Fault Interrupters for AC Systems.
- 2.3 ANSI C37.61/IEEE Std 321 use latest revision IEEE Standard Guide for the Application, Operation, and Maintenance of Automatic Circuit Recloser.
- 2.4 The Recloser manufacturer must be ISO-9001-latest revision certified.

3.0 FUNCTIONAL REQUIREMENTS

The Recloser shall be designed to automatically interrupt and reclose a three phase or single phase alternating-current circuit. The Recloser shall have the ability to be operated remotely via cellular control. The Recloser shall have a programmable electronic control that allows the operating characteristics to be changed without de-energizing the Recloser. The Recloser shall have the ability to operate as a Recloser, a Sectionalizer, or a switch without requiring additional/different hardware or software.

4.0 PERFORMANCE REQUIREMENTS

4.1 Ratings

4.1.1	Nominal System Voltage (kV, RMS)	12.47 kV
4.1.2	Rated Maximum Voltage (kV, RMS)	15.5 kV
4.1.3	Interrupting Current (kA, RMS, Symmetrical)	12.5kA
4.1.4	Nominal Continuous Current (A, RMS)	800A
4.1.5	Frequency(Hz)	60 Hz
4.1.6	Number of Phases	3

4.1.7	Basic Insulation Level (BIL, kV)	110 kV
4.1.8	Power Frequency Withstand –Dry (kV)	50 kV for 1 minute
4.1.9	Power Frequency Withstand –Wet (kV)	45 kV for 10 seconds
4.1.10	Arc Extinction Medium	Vacuum
4.1.11	Insulating Medium	Solid dielectric
4.1.12	Mechanical Operations (Open-Close)	10,000 minimum
4.1.13	Weight of Recloser	300 lbs. Maximum

5.0 ACCESSORIES AND ADDITIONAL REQUIREMENTS

5.1 Construction

- 5.1.1. The Recloser shall be provided with a manual-tripping lever that requires no external power for operation. The tripping lever shall open all three phases simultaneously. The manual tripping lever shall be suitable for operation with a hot-line stick in accordance with IEEE C37.60. The tripping lever shall be yellow in color, and be able to provide an indication of the lever's status both locally and remotely in SCADA.
- 5.1.2. The mechanism cabinet shall be manufactured from painted aluminum or stainless steel. Color shall be ANSI 70 gray.

5.2 Mechanism

- 5.2.1. The mechanism shall use one magnetic actuator capable of fast opening and closing operations with no more than 0.2 -second recharging delay. Spring operated or high voltage solenoid mechanisms are prohibited.
- 5.2.2. The design shall permit multiple open-close operations after the loss of primary control voltage to allow dead line operation. The contractor shall indicate the source of the power of the solenoid operation, either from the controller or battery system. The Recloser assembly shall be supplied with Dead Line operation, which its close and trip power shall be supplied from the controller or batteries.
- 5.2.3. The switch shall contain no high voltage closing coils.
- 5.2.4. The Recloser shall be capable of three-phase gang-operation when controlled by the external trip handle. The Recloser shall be programmable for either single-phase or three-phase operation. The poles of the Recloser shall be modular and independently-driven to facilitate maintenance. A motor operated mechanism is prohibited.
- 5.2.5. Any special tools or measurement devices required for routine inspection and maintenance shall be included in the bid. A minimum of 1 set of tools for every one unit ordered shall be supplied, at no additional cost to AE.
- 5.2.6. The Recloser must have a manual bypass.

5.3 Solid Dielectric Module

- 5.3.1. The solid polymer module shall be highly resistant to ozone, tracking, and ultraviolet rays. A 3RD party supplied independent test report shall be included, with delivery.
- 5.3.2. The insulating material shall be constructed of a highly damage resistant solid dielectric. The bushings shall be resistant to impact, ozone tracking, and damage from UV light.
- 5.3.3. The use of SF 6 gas or oil insulation is prohibited.

5.4 Vacuum Interrupters

Current interruption shall occur in vacuum interrupters, providing minimum and even contact wear, long life and maximum reliability.

5.5 Current Sensing

Three current transformers shall be provided for protection, instrumentation, metering and shall be capable of accurately monitoring full fault duty and providing accurate oscillographic data up to the full interrupting rating of the unit. The self-shorting current transformers shall be embedded in the Recloser, and shall not be damaged or open-circuited by disconnecting the controller from the energized Recloser. CT accuracy shall be 1 %.

5.6 Voltage Sensing

Six (6) total potential transformers shall be used for voltage sensing with three on the source side of the recloser and three on the load side of the recloser. The Recloser shall have an option to use three embedded voltage sensors on the load size of the Recloser, and three external PT's on the source side of the Recloser. The voltage sensing shall be capable of measuring 15.5kV to ground.

1. The potential transformers shall have a metering class, with a 60:1 ratio and 1000 VA capacity, 7200/120V. PT's shall have an accuracy of 1 %.
2. If embedded voltage sensors are installed on the load side, these sensors shall have an accuracy of 1% and shall not have any known issues with drifting accuracy

5.7 Mounting Frame

5.7.1 The Recloser shall be provided with a corrosion resistant galvanized or aluminum mounting frame for pole mounting.

5.7.2 Each mounting frame shall be supplied with six (6) polymer 10 kV (8.4 kV MCOV) Heavy Duty Surge Arresters as specified There shall also be an assembled frame for mounting (6) Potential Transformers (PT), (3) on the source side and (3) on the load side. Control power for the controller shall be supplied by source side potential transformers or control power transformer. The voltage transformer shall have solid dielectric bushings which shall be resistant to impact, ozone tracking, and damage from UV light.

5.7.3 The six polymers 10 kV (8.4 kV MCOV) Heavy Duty Surge Arresters shall be one of the following arresters listed or equivalent:

1. Cooper catalog number UHS10050A1A1A1A
2. Ohio Brass catalog number 213709-7214
3. Maclean catalog number ZHP010-0000000

5.7.4 The Recloser and all components shall be mounted and ready to install from the contractor.

5.7.5 Lifting lugs shall be provided in accordance with IEEE C37.60.

5.8 Control Cable

The Recloser is to be supplied with a UV protected cable at a minimum length of 50 feet. The control cable must include a 32 pin receptacle on end connecting to controller cabinet base. The cable must have weatherproof connectors for controller base.

5.9 Control Power

The Recloser is to be supplied with a UV protected cable at a minimum length of 50 feet. A control power cable connected to the control via a circular connector to a junction box shall be supplied. The junction box shall be connected to a voltage transformer which shall be provided.

6.0 ELECTRONIC CONTROLS

6.1 Cabinet Construction

- 6.1.1 The control cabinet shall be NEMA Type 3R and IP54 constructed of aluminum or stainless steel with #6 AWG control ground lug appropriately mounted to the interior of the cabinet so that the cabinet is solidly grounded. The enclosure shall be designed and tested to withstand weather conditions associated with the outdoor equipment.
- 6.1.2 The 12 VDC shall be available via terminal block in control cabinet with one (1) A min. capacity.
- 6.1.3 The electronic control and communication surge suppressor shall be prewired and mounted suitably in the control cabinet. Any additional modules required to meet the relay functions under Section 6.5.3 shall be prewired and mounted suitably in the control cabinet.
- 6.1.4 Convenience receptacle rated at 120VAC at 5A capable of powering diagnostic equipment/laptop shall be provided.
- 6.1.5 Low voltage cabinet shall have current and voltage test switches for secondary current and voltage injection.
- 6.1.6 The Recloser Control cabinet shall have an access from the ground level.
- 6.1.7 Connection on the bottom of the control cabinet must have the cover option

6.2 Electrical Wiring

- 6.2.1 The Recloser Controller cabinet internal electrical wiring (wire shall be typed SIS or TFE) shall be point-to-point, without splices, tee connections or double lugs. Wiring bundles shall be supported and mounted with cable ties.
- 6.2.2 The Recloser Control shall have appropriate protection from overvoltage and overcurrent from its various voltage and current inputs as well as from its control power.

6.3 BATTERIES

The Recloser assembly shall be supplied and shipped with DC storage batteries. The batteries shall be the latest designed 12-volt batteries (Brand name Power Sonic PS12120). These batteries shall be of a nominal physical size such that they shall fit in the same Recloser cabinet provided by the supplier.

The Supplier will supply safety covers for battery terminals. The battery shall be sized to run the control for at least 38 hours with no presence of AC power. The battery shall have a quick disconnect connector between the battery and the control. Batteries shall not emit corrosive gases due to a NEMA 3R sealed enclosure.

6.3.1 Battery Backup

- 6.3.1.1 The battery shall be charged by a temperature compensated charging circuit, allowing the battery to charge at an optimal rate, extending battery life.
- 6.3.1.2 The battery charger shall be an integral component in the control, allowing the battery to be remotely monitored and tested.
- 6.3.1.3 The battery shall have a programmable, automatic daily load test performed to determine the battery life.

6.4 Communication Hardware

- 6.4.1 The primary means of communication to the Recloser to provide SCADA information transportation shall be via Sierra Wireless GX450 radio, antenna, suppressor, and coax cables (or Standards Engineer approved equal). Sierra Wireless GX450 devices shall be provided with a copper Ethernet port (10/100TX).
- 6.4.2 Following is the detail for the part number for antenna, suppressor and coax cables

No.	Description	Manufacturer	Part Number
1	Antenna	Embedded Antenna Design	FCMO35303-SMSM-2K
2	Suppressor	Terrawave	TW-LP-RPSMA-P-BHJ
3	Coax cable	Embedded Antenna Design	RG58-SF-SM-1M

- 6.4.3 Two suppressors and two coax cable shall be provided for each antenna
- 6.5 Control Features (Hardware and Software)
- 6.5.1 The controller for the Recloser switch shall be programmable. The bidder may be requested to demonstrate that the Recloser control complies with the specification prior to award recommendation. The bidder shall have five working days to comply with this request, after being notified by AE to comply with such a request. Failure to comply with the request may be grounds for bid rejection. The demonstration shall be given in Austin, Texas at no expense to AE.
- 6.5.2 Overcurrent protection – U.S. curves, IEC curves, and traditional Recloser curves.
- 6.5.3 Relay functions
- Custom programmable overcurrent protection
 - 59N (Three-phase overvoltage)
 - Distance to Fault locator
 - HIZ (High Impedance Fault Detector)
 - 50/51/67 P and G (Three-phase directional overcurrent protection)
 - 32P/N (Reverse Power)
 - 46 (Phase Balance)
 - 81 (Frequency)
 - 27 (Under-voltage)
 - 79 (Reclose)
 - 85 (Transfer Trip capability) – Shall utilize Mirror Bit protocol, which can be accommodated by an SEL 651 R-2 .SEL 651R-2 shall be provided with an Ethernet port.
- 6.5.4 Complete metering capabilities and the ability to monitor this information remotely in SCADA – phase voltages & currents (including demand currents), sequence voltages & currents, power (including demand), Active power per phase, Reactive power per phase, frequency and energy & power factor, the Recloser control shall report all metered quantities in primary quantities (current in A primary & voltage in kV primary).
- 6.5.5 Flexible control logic and integration
- 6.5.6 Selective load shedding
- 6.5.7 Control logic – control shall include user programmable logic functions for protection, control, and monitoring.
- 6.5.8 Auto-reclosing control – minimum five shot control
- 6.5.9 Event reporting and sequential events recorder
- 6.5.10 Battery charging and monitoring shall be incorporated into the control which will monitor and report the state of the battery and the battery voltage both locally and remotely in SCADA.
- 6.5.11 Programmable LED control status indication to monitor alarms and status

- 6.5.12 Communication software shall include DNP 3.0 Level 2 protocol and Modbus protocol. The control must be supplied with messaging according to IEC61850 Type 1, Class P1 for fast tripping purposes. Each Recloser unit shall be individually addressable by any of the above protocols. Control shall be programmed from the front or rear panel using a standard cable such as RJ-45, RX-232 Serial or USB. The control must include an optional LC fiber optic connector.
- 6.5.13 The controller must have at least 2 different user access levels that are password restricted, including Local and Remote user access. For Local access, passwords of at least 4 characters must be required. For Remote access, passwords of at least 8 characters must be required
- 6.5.14 The controller must be Field Re-Programmable. The unit must include a “flash” boot loader that will support re-programming of the main control unit firmware.
- 6.5.15 Local and Remote (SCADA) control of the following functions:
- An open/close control which allows the operators to open or close the Recloser.
 - A ground trip control which gives the operator the ability to turn on or off trip commands asserted by protection curves for the ground phase.
 - A reclosing trip control which gives the operator the ability to allow the Recloser to have multiple shots, or to lockout on one shot.
 - A fast curve enabled to control which gives the operator the ability to enable or disable the fast protection curve.
 - Identify a fault on each phase.
 - A loss of source (AC) power
 - Open/close state of the Recloser
 - Status of the hotline tag control
 - The lockout state of the Recloser
 - Status of the control for ground trip
 - Status of the control for reclosing
 - Status of the control for fast curve enabled
- 6.5.16 A remote enable control which allows the Recloser to be controlled remotely or exclusively locally
- 6.5.17 Local control of the following function:
- A hotline tag control which gives the operator the ability to prevent the Recloser from closing. The Recloser can be opened; however, it shall not close while this control is enabled.
 - The control shall have inputs for 6 voltage signals. These signals may come from either 120V PT inputs or embedded voltage sensors in the Recloser pole.
 - All software and firmware including operation and communication software shall be provided with the latest version at the time of the delivery. Proper software programming instructions shall be provided.
 - The controller shall have a minimum of two (2) serial communication ports in the form of RS-232 and RS-485. All ports shall be capable of sending data at 19,200 baud.
 - The controller shall have one (1) HMI communication port.
 - The Recloser I/O module shall have a minimum of 8 digital inputs, eight digital outputs, and a fiber-optic communications port.
 - Each port shall be programmable and capable of utilizing DNP 3.0 Level 2 Protocol. All DNP points shall be user selectable or capable of SCADA operation.

7.0 TESTS

- 7.1 The Recloser shall be tested in accordance with ANSI/IEEE C37.60, section 7, before shipment. Two (2) Copies of certified Production Test reports shall be furnished to verify the correctness of control wiring and proper functioning of all equipment. These test reports shall be submitted to AE Standards no later than two (2) week prior to the agreed delivery date.

- 7.2 The calibration curves and test data shall be supplied for U3 and U4 curves across the full range of settings for current and time dial per ANSI C37.60 section 7.1 and section 6.11.2.

8.0 EQUIPMENT IDENTIFICATION

Each Recloser shall have an attached metal nameplate containing, as a minimum, the following information:

Manufacturers' Name:
Manufacturers' Model Number:
Manufacturers' Serial Number:
Control Voltage in Volts:
Date of Manufacturing:
Recloser Maximum Rated kV:
Maximum Interrupting Rating:
Purchase Order Number:

9.0 SERVICE AND MAINTENANCE AND RELIABILITY

- 9.1 No field calibration shall be required to maintain the accuracy of the Recloser switch.
- 9.2 The Recloser manufacturer shall provide diagnostic and troubleshooting software at no cost.
- 9.3 The Recloser manufacturer shall provide two (2) copies of software for installation, operation, and related field operation manuals at the time of shipment.
- 9.4 The manufacturer shall notify Austin Energy of any software and firmware upgrades and provide upgrades to Austin Energy free of charge for the life of the product.
- 9.5 The manufacturer shall provide a current list of customer's address, name(s), and telephone number using the Recloser being bid.
- 9.6 The manufacturer shall provide a one-time free training on operation and maintenance on products new to Austin Energy.